

Breathing Walls, Envelopes and Screens for Cross-Species Co-Living Adaptation of Built Environment: The Bio-Climatic Layers in Systemic Approach to Architectural Performance

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Abstract

The paper suggests a possible systemic interaction with built environment that is to lead towards its transition to Post-Anthropocene through cross-species co-living oriented governance. Today, governments across the world, such as Czechia, UK, Norway, Turkey, Canada or US are releasing strategies and programs for climate adaptations, discussing weather, biodiversity and food security (Czech Republic Ministry of the Environment & Czech Hydrometeorological Institute, 2015; Department for Environment Food & Rural Affairs (DEFRA), 2018; Flæte et al., 2010; Republic of Turkey Ministry of Environment and Urbanization, 2012; Richardson, 2010; U.S.Department of State, 2014). The paper exemplifies and seeks for systemic relations and reflections of gathered documentation of breathing walls, envelopes and screens that are generating bio-climatic layers in built environment. The diverse study journeys samples that were co-designed through vernacular culture and the author's own research by design speculations are investigated and speculated upon through gigamapping. Gigamaps are devices for design inquiry rather than analytical tools like those used in systems engineering or in hard systems models (Sevaldson, 2018). Accordingly, this Gigamapping is not to present any hard data model but to inform and speculate on the investigated field that is grounded in research by design on cross-species co-living in built up environment through possible architectures and architectural and urban design parasites transitioning towards synergetic landscapes of our envisioned futures.

Introduction

'... We have a good sense of the passage from the Foucauldian disciplinary biopolitics for which bodies are captured, enveloped, individuated, nominated, and enumerated into a governable interior, into the Deleuzian "society of control" for which open fields of interfaces, switches, and gateways quantify the traces and trails of partial subjects in motion as they pace through urban landscapes, wandering without tether because there is no outside to which they might escape. Now another regime appears, one that organizes its biopolitical governance through a more immediate and affective means: the sensing and codification of risk at the level of skin (a mammal's largest sensory organ, a cell's essential structural support, a planet's most exposed inventory of life). This epidermal biopolitics is based less on "seeing like a state" than upon what a governing apparatus can sense.....

.... Drawing lines upon a planet, either by the physical inscription of walls and envelopes or by the virtual geometries of massless legal borders, is essential to anthropic politics. (Think Carl Schmitt's The Nomos of the Earth), and the multiplication and confusion of these drawings by planetary-scale computational architectures puts into play jurisdictional designations and subdivisions, or the refusal of same, and points toward unfamiliar models of geopolitical design and designation.' (Bratton, 2013)

The today discussion on breathing walls in context of architectural performance and atmospheres starts with theoretical work by David Leatherbarrow. The theme is discussed in dependency of the argumentation for shift within understanding of the architectural profession, 'the architecture oriented otherwise' (Leatherbarrow, 2009). Around the start of this millennium, there started to rise a serious discussion on an architecture's interaction with its environment, which also involves its penetrability and a biotic and abiotic agency through its boundaries (Addington, 2009; Addington & Schodek, 2005). In that time the authors such as Addington, Leatherbarrow, Hensel and others mainly seek for their references in modernism, referring to architects such as Le Corbusier (see Figure 9), Costa (see Figure 8) and similar (Addington, 2009; Hensel, 2013; Leatherbarrow, 2009). However, this might be due to the reason of the general acceptance of this style within the conservative society of the architectural profession.

The referred modernists most likely started exploring the fields of bio-climatic architecture (not all of them will be discussed in this paper) thanks to political situations in countries with extreme climates. Due to the entry of modernism into a different climatic, eco-systemic, cultural and political situations, it was not possible to neglect traditional influence of those countries. Therefore, they had to adapt to the local social and climatic environment (Camacho, Sacht, & Vettorazzi, 2018; Costa, 2012). Shading and cooling systems are clearly more profuse in sunny hot climates, where they have traditionally been absolutely necessary, just themselves cooling there its environment approximately about 10 °C (based on author's measures). Many of these strategies are closely linked to the culture that created them and its relation to privacy, since cultures have often come into being in a determined climatic Environment (Vegas, Mileto, García Soriano, & García Sáez, 2014). Direct references of breathing walls, envelopes and screens are substantially clear in oriental, often Arabic, architecture (Fathy, 1986). These are often attached to semi-interior spaces such as '*kishks*' (wooden kiosks) of '*Turkish House*' (Fakouch et al., 2004). These, similar and other gradual bio-climatic layers cover critical performance for habitable and edible landscape in extreme climates across the species, including humans.

The cross-cultural gigamaps suggest (see Figure 1 and Figure 2), that such performance oriented oriental architectures had a critical influence on architecture in Portugal and Spain, which than influenced architecture in Latin America, as stated in a review by Camacho et al. (Camacho et al., 2018). Therefore, it is clear that the 'schools of thoughts' (Hensel, 2015b) are transferrable across the regions when adapting to local situations and offering local specific solutions. This becomes also critically important with species migration towards north and south of the equator caused by climate change (this also includes humans). The paper seeks for such adaptations to the changing world.

It seems that today systems view agrees with Eastern philosophy on the interdependence of all systems, which function in patterned networks, as established by organismic biology, new physics, cognitive science, ecology, and other disciplines (Gunaratne & Gunaratne, 2017). Therefore, this paper is not planning on discussing on any originality of the concept of penetrable boundaries as it seems richly appearing across variety of indigenous, vernacular and traditional cultures. It is seeking for its richness in social, cultural, natural and, generally, eco-systemic, performance, its variations, relevance, evolution and adaptation to today architectural and urban design. It investigates the bio-climatic and socio-environmental relations of cross-species co-living in various spatial layers, 'onion peels' (Davidová, Zatloukal, & Zimová, 2017), of built environment that is enabled through such penetrable boundaries. It shows that such co-living has been common in many traditional architectures, specifically in those with extreme climates (Davidová & Raková, 2018; Davidová & Uygan, 2017). Following a Semperian tradition (Semper, 2010), it will relate such with material performance. However, such investigation is expanded into advancement of cross-species and material co-performance that generates co-living situation. The discussed examples include prototypes from: Cappadocia, India, South Portugal, Brazil, Cyprus, Tunisia, Morocco and Norway and are concluded in synthetic speculative prototype for recent mild climate regions.

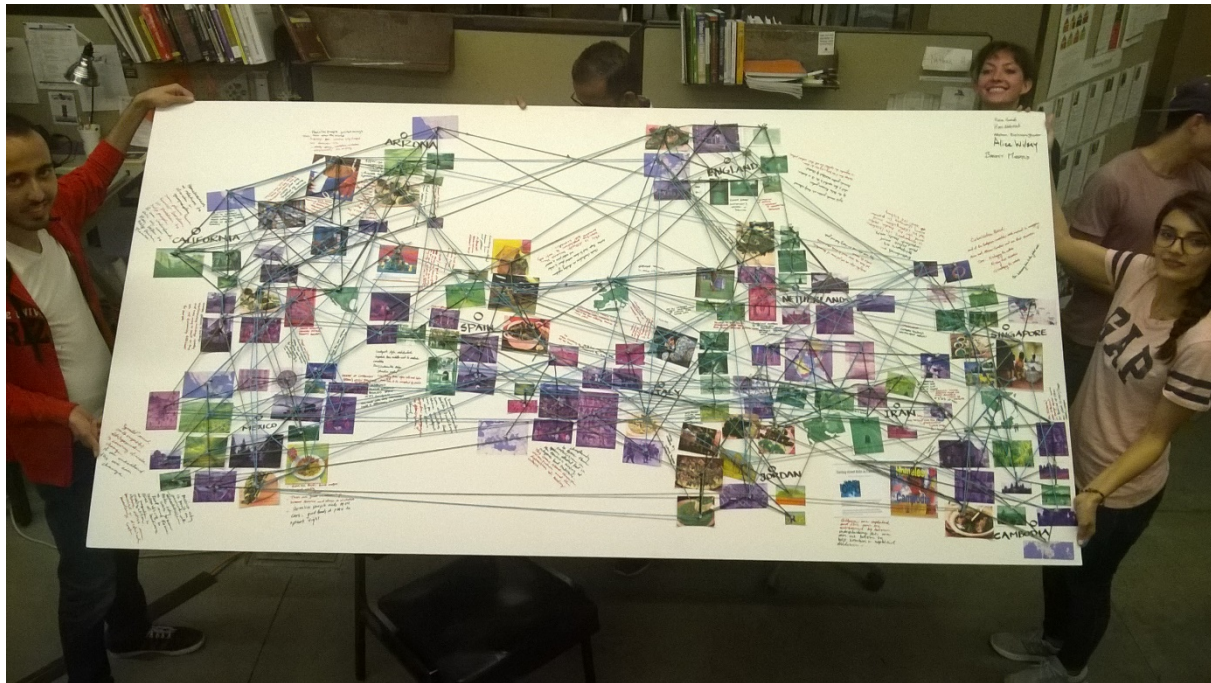


Figure 1: Gigamapping the Architectural Performance: Appreciation of New Coming Cultures workshop result at the University of Arizona (Davidová & Gasselöglu, 2017). The MSc students with various backgrounds were mapping cultural influence flows across the countries of their origin, current place and speculated futures. The Gigamapping employed fields distinguished by colour coding and storytelling as an evaluation of relations (photo: Davidová 2016)

Breathing Walls, Envelopes and Screens

The penetrable boundaries – The breathing walls, envelopes and screens – appear in various, often extreme, territories, generating socio-bio-climatic layers in built environment that were co-designed through variety of vernacular cultures. They generate socio-bio-climatic peels of onion principle, being fences, balconies' separations, shutters, airlocks of the buildings or other semi-spaces boundaries or facades. While doing so, they can provide non-discrete layers for cross-species' climate comforts and social interactions with different levels of privacies, edible and co-habitable landscapes. According to Hall, two categories of the sensory apparatus can be defined: the distance receptors – eyes, ears, nose – and the immediate receptors – skin, membranes, muscles. These receptors have different degrees of specialization and different functional spheres (Gehl, 2011). The discussed semi-interior spaces should provide transition and exchange zone between the two and its larger context of cities' metabolisms.

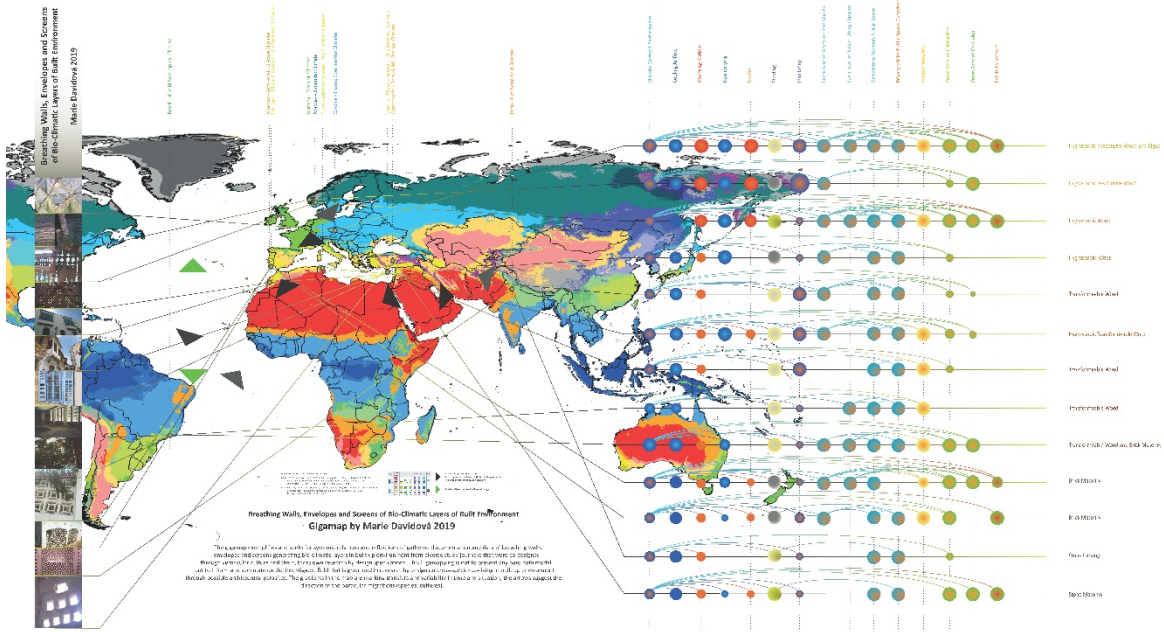


Figure 2: Breathing Walls, Envelopes and Screens Gigamap (gigamap: author 2019, Köppen-Geiger Climate Classification Map: Beck et al. under a creative commons licence (*Beck et al., 2018*)) (gigamap: Davidová 2019)

The above gigamap (see Figure 4) exemplifies and seeks for systemic relations and reflections of gathered documentation and data of breathing walls, envelopes and screens from diverse study journeys and the author's own research by design speculations. It is relating different observed samples and their various eco-systemic performances, their climate zones and locations with historical migrations of cultures and recent south and north from the equator migrations of species due to the climate change (Chen, Hill, Ohlemüller, Roy, & Thomas, 2011). The last one, amongst all others, also involves migrations of human cultures again.

This Gigamapping is not to present any hard data model but to inform and speculate on the investigated field that is grounded in research by design on cross-species co-living in built environment through possible architectures and architectural and urban design parasites such as breathing screens, envelopes and walls or more penetrable installations. The gradients in the map are marking transfers and variability in time and situation, the arrows suggest the direction of the particular migrations (species, cultures).

- **Cappadocian Breathing Walls**

The early Cristian (followed by others) cultures' cave dwellings in Cappadocia developed specific model of co-living with pigeons (see Figure 5) due to political reasons. The pigeon spaces that are in caves situated above the human spaces generate a natural ventilation through their shaft connection through stack effect. This is because the by the pigeons heated spaces co-create the air flow as the air that is hotter than the outdoor environment is forced to exit through the breathing walls. In addition, the pigeons' excrements were that time used as fertilisers for the otherwise arid land, enabling the culture to survive (Kempe, 1988). Similar situation appeared for the therefore rich pigeons' cultures that were/are provided opportunities of habitation in otherwise rather extreme climate and terrain

conditions. The detail from the gigamap (see Figure 6) shows various eco-systemic co-performances of the brick build breathing walls of these caves. It suggests that the wall participates in co-generation of climate comfort for the related climate zone, edible and habitable landscape and cross-species interaction for the symbiotic dwelling between humans and pigeons, whilst offering privacy in difficult political situation. Such systemic dependencies co-generate the metabolism of the settlement that would otherwise hardly sustain.



Figure 3: Pigeon houses in Zelve valley (photo: Davidová 2016)

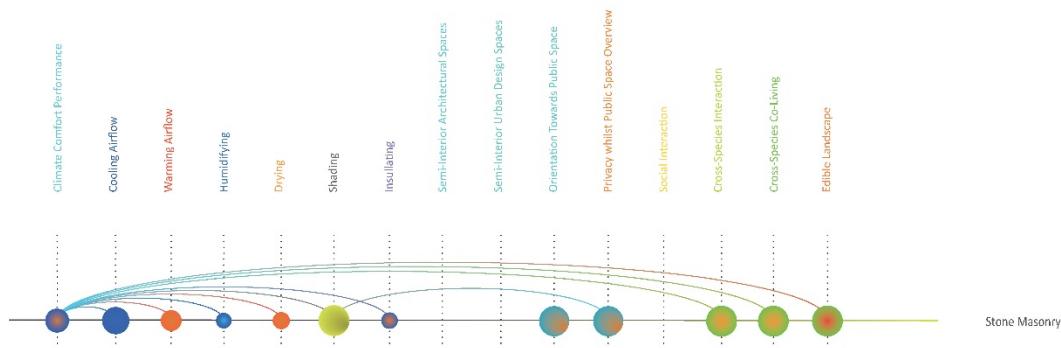


Figure 4: The detail of the gigamap showing eco-systemic performance of the breathing wall of a pigeon house in Cappadocia (gigamap: Davidová 2019)

- **Jaali**

Indian Jaalis appear either in a form of breathing walls or carved stone (see Figure 5) or lattice work screens with wide range of its porosity. The size of the openings (or even its existence) and the material depends on the availability of the material in the region and its targeted climatic performance.

Therefore it depends on its climate zone with variety of humidity and temperature level ranging from arid to tropical and very hot to very cold(Beck et al., 2018) ; as clear from Figure 4. The climatic performances of jaalis and their atmospheres are closely related to culture in reference to co-living and co-performance with nature, social intimacy and security level (or even gender based apparteid) and religion related geometrical patterns (Kamath & Daketi, 2016). Pourpose or not, the nature, such as plants or insects and smaller animals penetrate through such streens and such co-living situations are overally understood as part of Indian culture, being symbolic for different shrines or integrated in traditional cities' metabolisms. The below detail from the gigamap (see Figure 8) shows speculated eco-systemic performance of the jaali on the picture above (see Figure 7). In the not too dry conditions of Delhi with Monson rains, it doesn't cover too much of the humidifying performance, whilst generating climate comfort. The cultural purpose of the building where it is used, the mosque, requires certain privacy and intimacy towards public space and spiritual, climate, light and pattern related, atmosphere. As opposed to other religions in the location, it doesn't integrate much of cross-species interaction and focuses more on the social and climate comfort.

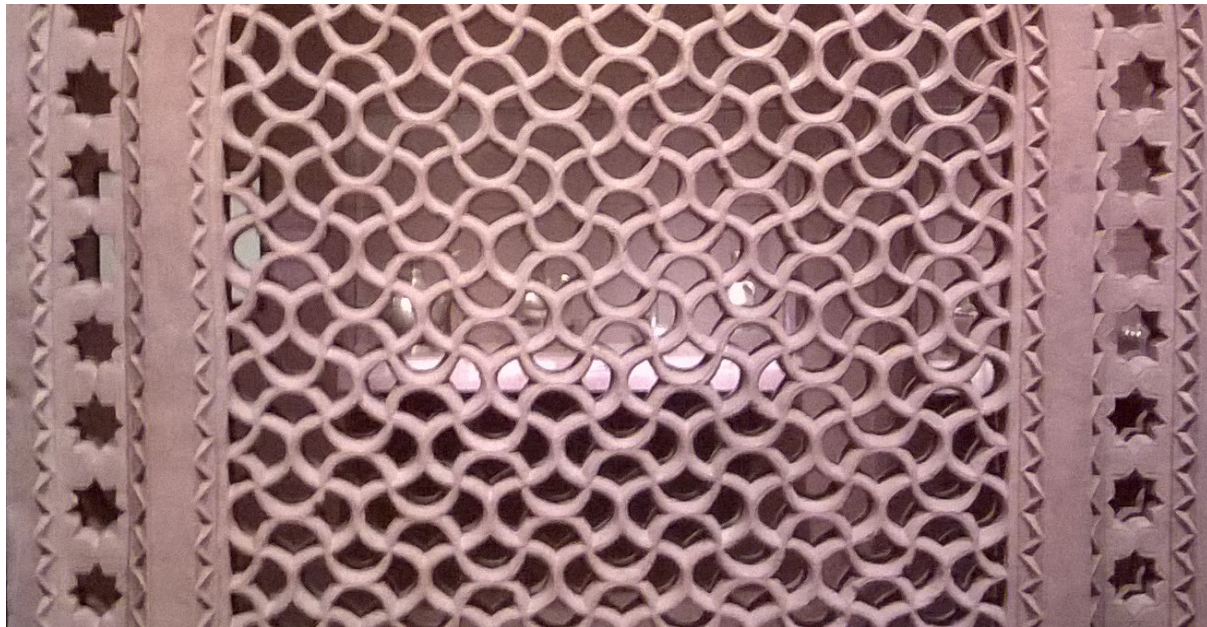


Figure 5: Jaali, Delhi, India 1605-1627, Houston Museum of Fine Art, USA (photo: Davidová 2016)

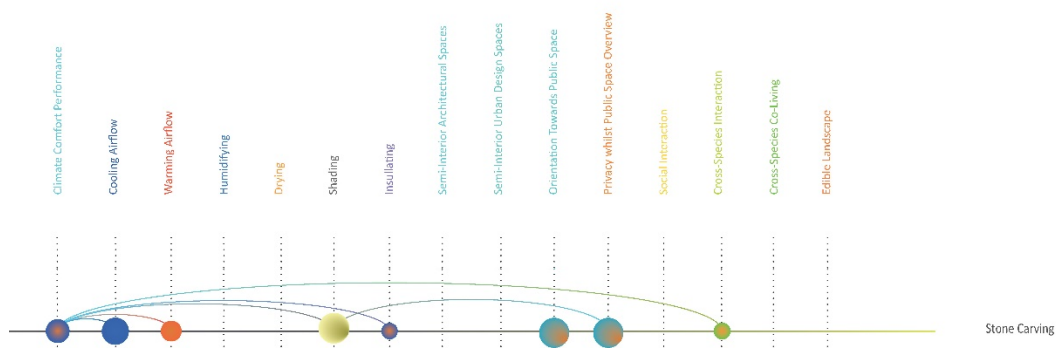


Figure 6: The detail of the gigamap showing eco-systemic performance of the breathing screen jaali from Figure 7 above (gigamap: Davidová 2019)

- **Portuguese Breathing Walls**

In South Portugal that was under Moor influence, it is possible to map ceramic breathing walls and lattice works that become a typical part of local architecture. These breathing walls are used for fences (see Figure 11), terraces, windows filling or walls of semi-interior spaces (see Figure 7). They therefore support circulation of humidified ocean air across the local bio-climatic layers of build up landscape. Thanks to their existence, people can grow plants and produce nutrients in otherwise the overheated centres of their settlements (see Figure 11). It also allows for decent size species distribution and habitation and certain level of privacy and social interaction.

The below detail from the gigamap (see Figure 8) shows the eco-systemic performance of bounded semi-interior layer of otherwise mainly fully enclosed building. Its performance is to generate climate comfort and intimacy for mainly a heavier physical work and storing activities, whilst it offers cross-species interaction and nutrient storage and therefore provision opportunities through its penetrable boundaries.

The figure below (see Figure 9) shows how breathing walls are used in urban design to lower an urban heat island. Whilst not reducing the owners' privacy, the porous wall generates airflow's and the tree's boundary penetration into a public space, bettering the local micro-climate and communicating the courtyard's environment to public. Due to such private space porosity the generated climate comfort and edible landscape, both public and private, take critical part in the city's metabolism that consists of the mentioned layers such as the one above (see Figure 7). The below detail from the gigamap (see Figure 12) shows how the climate comfort relates to the cross-species habitation and interaction, whilst generating edible, partly public, landscape.

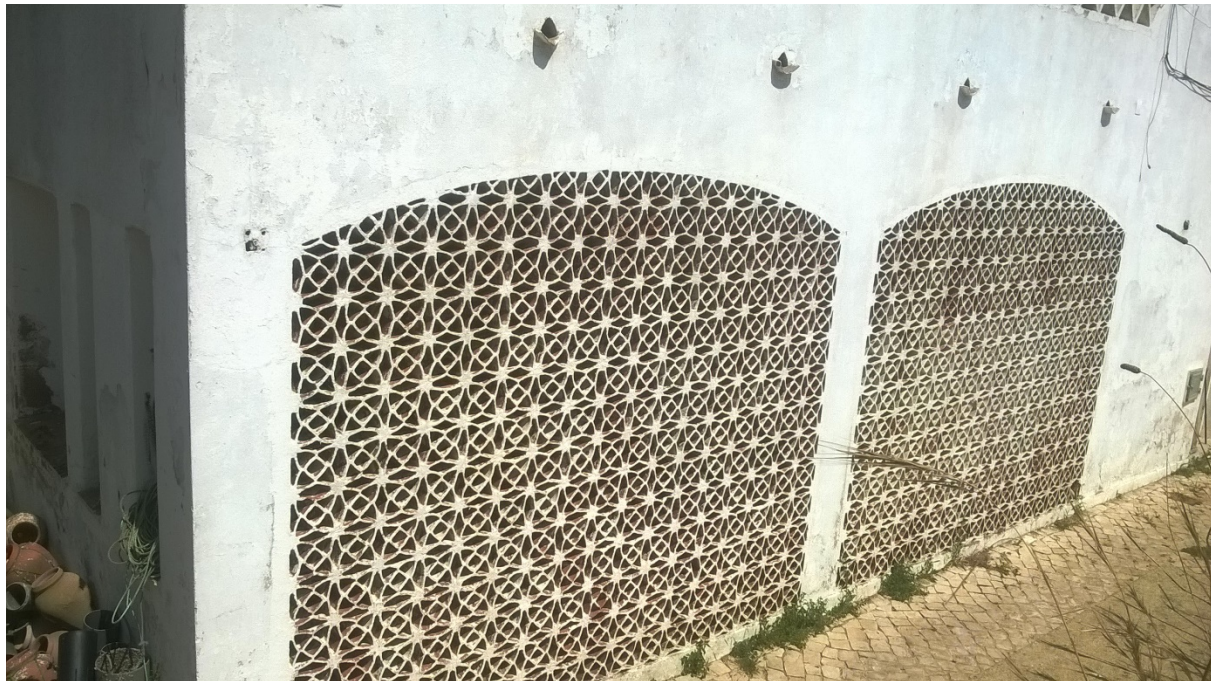


Figure 7: The breathing wall generates a bio-climatic comfort layer for a working and storing semi-interior space, Village of Salema, South Portugal (photo: Davidová 2017)

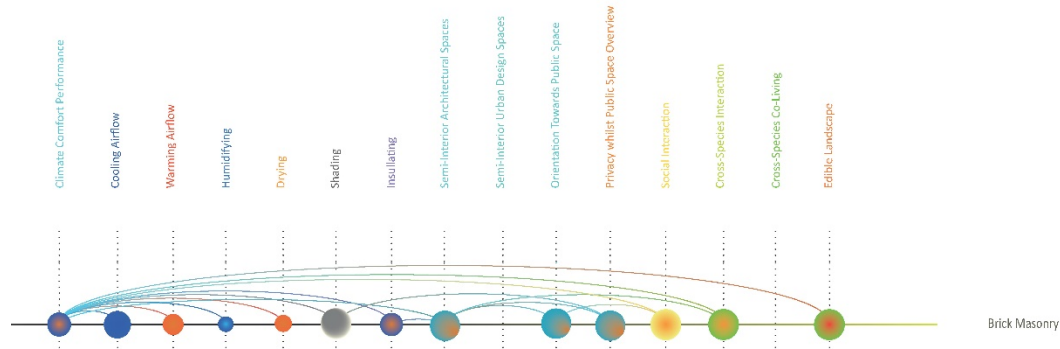


Figure 8: The detail of the gigamap showing eco-systemic performance of the breathing wall above (gigamap: Davidová 2019)



Figure 9: A courtyard bounding breathing wall generates bio-climatic layers for edible landscape in built environment, Village of Salema, South Portugal (photo: Davidová 2017)

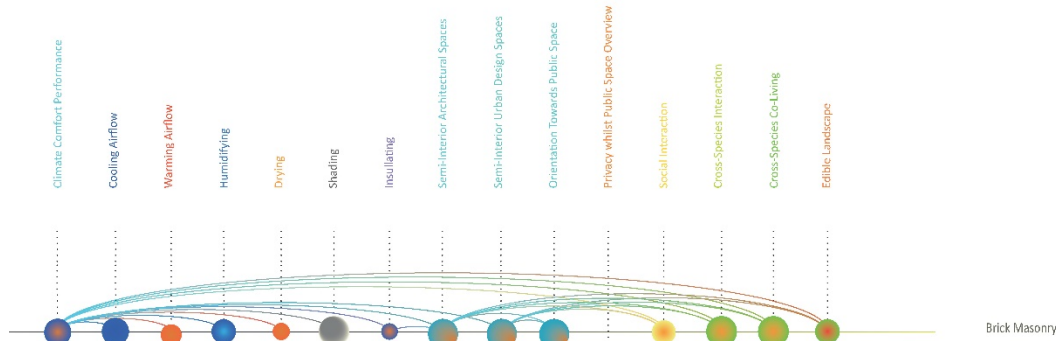


Figure 10: The detail of the gigamap showing eco-systemic performance of the breathing wall above (gigamap: Davidová 2019)

- **Cobogós and Brise-Soleil**

Whilst there are also indigenous references, the Brazilian breathing wall 'cobogó' originates from the combination between modernity (concrete) and [moor] traditional techniques (muxarabis, lattices and kneecaps). It emerged from the need to adapt the architecture to the climate with a compositional language that represents the modernity of the new times that results in an adequate constructive solution. Cobogó was patented in 1929, in the city of Recife –Pernambuco and its three creators, engineers: Amadeu Oliveira Coimbra, Ernest August Boeckmann and Antonio de Gois (the basis of the word cobogo) (Camacho et al., 2018). However, the word cobogó recently relates to different material-based breathing brick work, such as ceramics (see Figure 11).

The above combination of cobogós a operable 'brise-soleil' by Costa (see Figure 11) offers variety of performance for the habitants' dwelling selection. Whilst the operable screens offer variety of boundary penetration of sun, air and privacy, they require more service and are often fragile. The cobogos in this case offer an option of full openness in their centres and semi-level of privacy and shade on the edges. Being attached to balconies, they generate semi-interior urban design partly public spaces for cross-species interaction and co-living, therefore have the potential to take full part in city's metabolism (see Figure 12).

As opposed to the above example, the 'brise-soleil' of the Ministry of Education and Health Le Corbusier, Lucio Costa, et al., have merely only micro-climatic, shading and visual intimacy performance. However, in terms of an urban design, they have very positive effect on lowering heat island through reflecting the air flow, therefore cooling the outdoor environment. Therefore, they have also a positive effect on the surrounding eco-system that in the same time has bio-climatic performance itself (see Figure 13 and Figure 14).



Figure 11: Costa, Parque Guinle, Rio de Janeiro, 1947–53, combination of cobogoes a operable 'brise-soleil' moderating a micro-climate and letting to grow in vegetation into semi-interior spaces of an apartment block (photo: Davidová 2005)

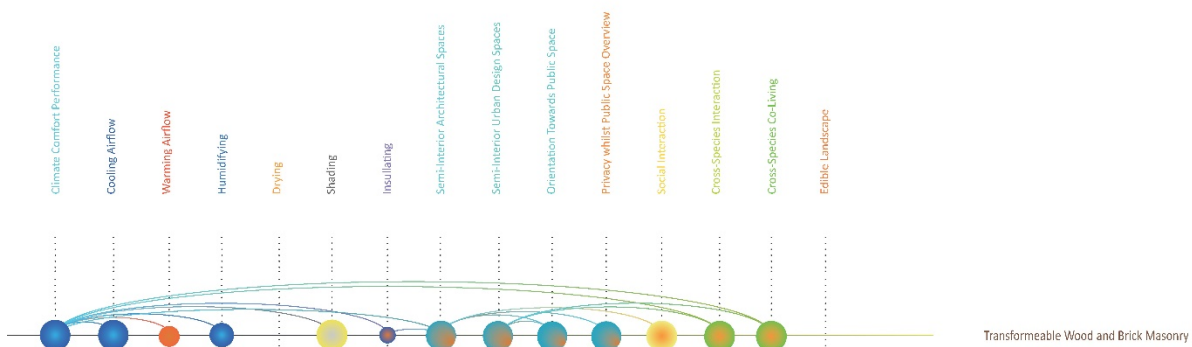


Figure 12: The detail of the gigamap showing eco-systemic performance of the combination of cobogoes a operable 'brise-soleil' above (gigamap: Davidová 2019)



Figure 13: Le Corbusier, Lucio Costa, et al., Ministry of Education and Health, Rio de Janeiro, 1937–42, operable outdoor jalousie ,brise-soleil' (photography: Davidová 2005)

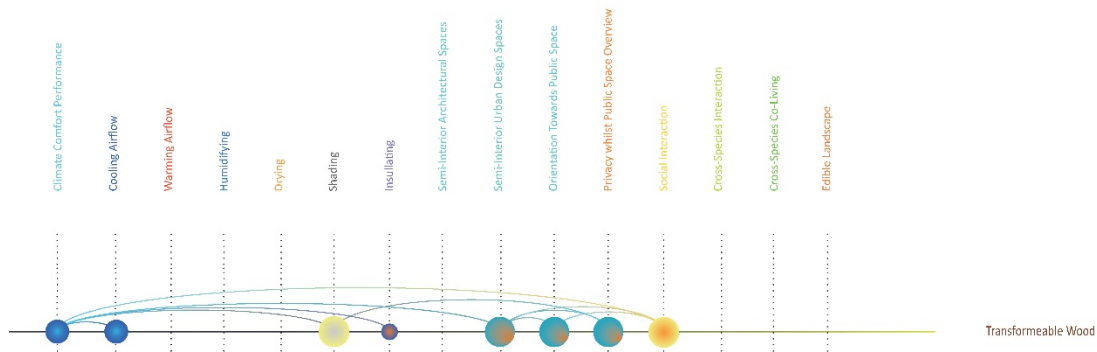


Figure 14: The detail of the gigamap showing eco-systemic performance of the operable 'brise-soleil' above (gigamap: Davidová 2019)

- **Transformative shutters**

Transformative shutters are spread across all Mediterranean cultures and most likely developed from the mashrabīyas, discussed in the following sub-section. These shutters can regulate the type of preferred penetrations either through operating its lamellas or through opening and enclosing the shutters flow (see Figure 15). Therefore, they can offer large variety of targeted privacy, social interaction, light, shading and air flow (see Figure 15, Figure 16, Figure 17 and Figure 18). There is an important point of human centred comfort of being in charge of the control of the boundary. On the other hand, the more interesting interpretation would suggest, that this boundary is a transformative system ready to adaptation for the coming conditions. This, however, needs to happen in interaction with the 'user'. The unpainted option offers also a non-human centred humidification of the circulated air (see Figure 17 and Figure 18). This combination of synergy between human and non-human controlled system suddenly starts to be more interesting. Also, in oriental architecture, the cantilevered enclosable space Kishk that is covered by those screens offers one more bio-climatic and privacy layer with one more transformable bio-climatic regulation (Fakouch et al., 2004) that may also motivate the potential of co-habitation across different species. As species mainly don't prefer to share the hearts of their dwellings but the spaces between.



Figure 15: Transformative shutters, Nicosia, Cyprus (photo: Davidová 2018)

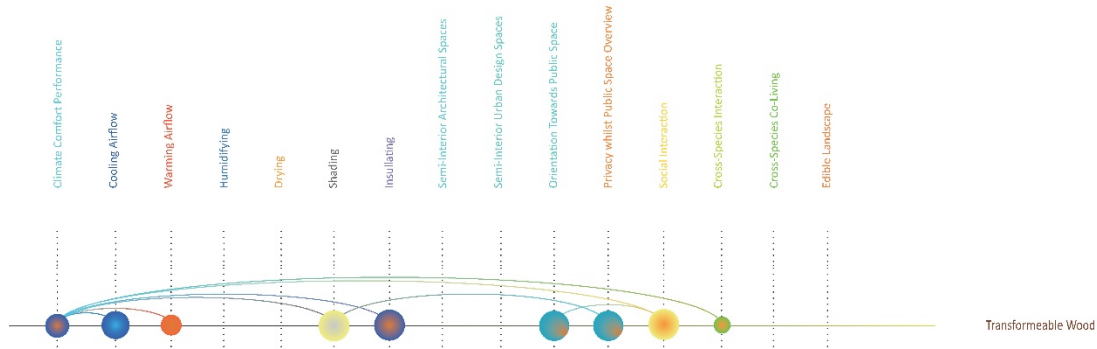


Figure 16: The detail of the gigamap showing eco-systemic performance of the transformative shutters above (gigamap: Davidová 2019)



Figure 17: Kishk, the cantilevered space typical for Turkish house, with transformable shutters with hygroscopic performance, Nicosia, Cyprus (photo: Davidová 2018)

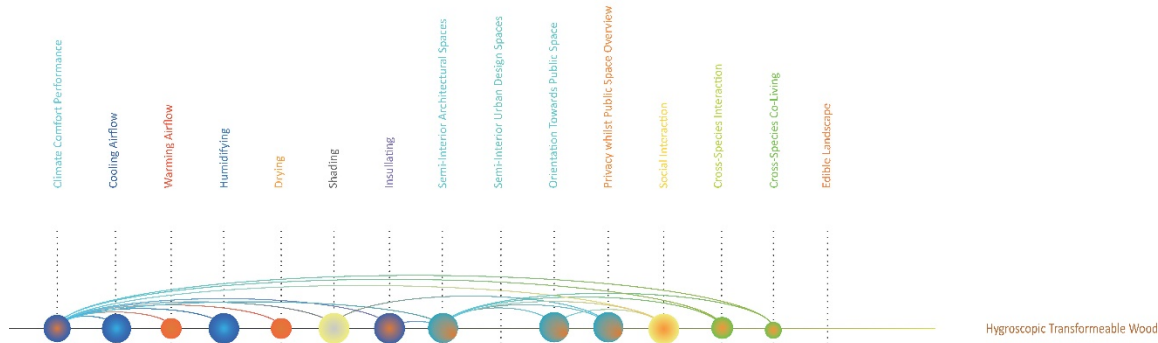


Figure 18: The detail of the gigamap showing eco-systemic performance of the transformative shutters with hygroscopic propertise above (gigamap: Davidová 2019)

- **mashrabīyas**

The oriental lattice screens, so called mashrabīyas (see Figure 19 and Figure 21), whose performance towards wood's hygroscopicity was largely investigated by Hasan Fathy (Fathy, 1986), are common across arid and Mediterranean climates. The urban fabric and its architecture in such locations is generated by layering penetrable and vapour evaporative bio-climatic layers: The public space oriented semi-interior spaces covered by mashrabīyas (see Figure 20 and Figure 22) are often combined with spaces that can be operated by enclosable windows (see Figure 19) leading further on towards spaces with ventilation chimneys or openings towards courtyard with plants and fountain. Many of the mashrabīyas are untreated for absorbing night humidity which is evaporated into the airflow passing through these layers on hot dry afternoons (see Figure 21 and Figure 22). The screens regulate different types of penetration from the street, including climate, privacy as well as small species such as insects that might be attracted by the inner gardens with fountains and better climate of such types of architectures (see Figure 20 and Figure 22). The bio-climatic layers of such dwellings have larger co-performative positive impact on the, often very dense and dry, metabolism of the oriental cities.



Figure 19: Kishk is a cantilevered space typical for a 'Turkish House' that is often enveloped by mashrabīya (Fakouch et al., 2004) (photo: Davidová 2017)

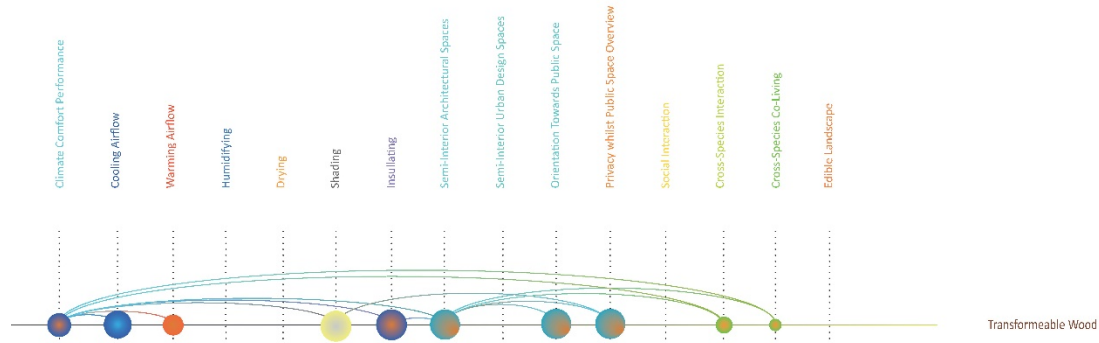


Figure 20: The detail of the gigamap showing eco-systemic performance of the Turkish House' with mashrabīya above (gigamap: Davidová 2019)

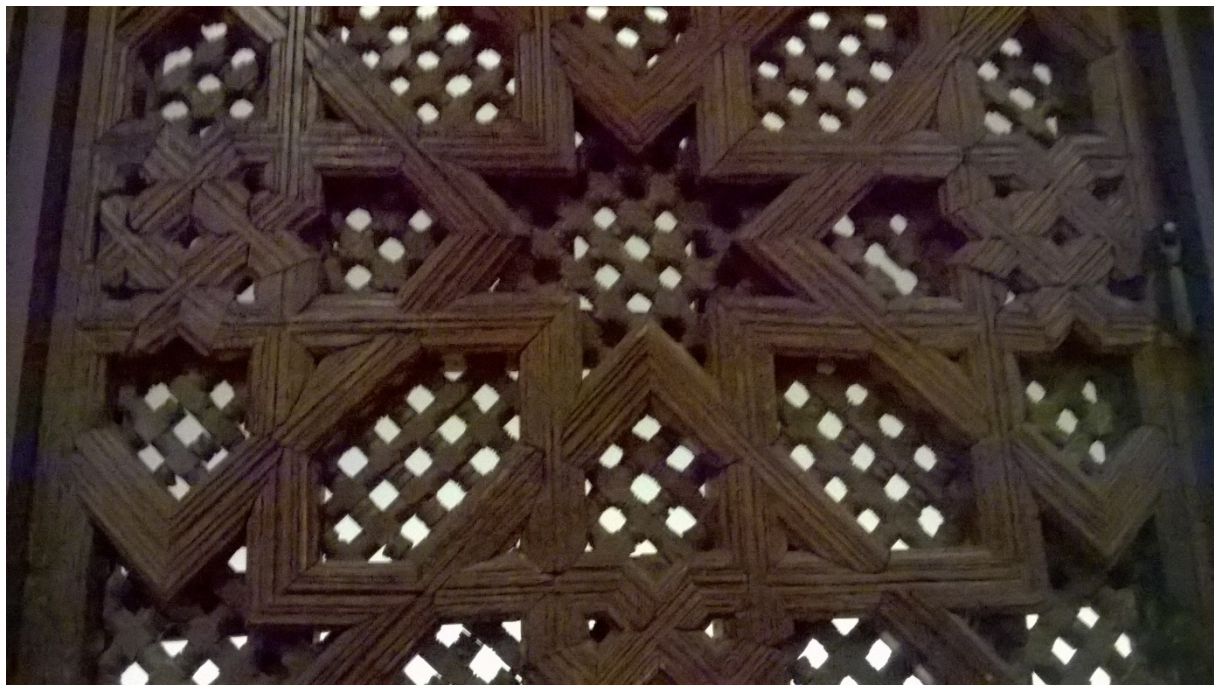


Figure 21: Moroccan mashrabīya from 15th century, Houston Museum of Fine Art, USA – desert climate (photo: Davidová 2016)

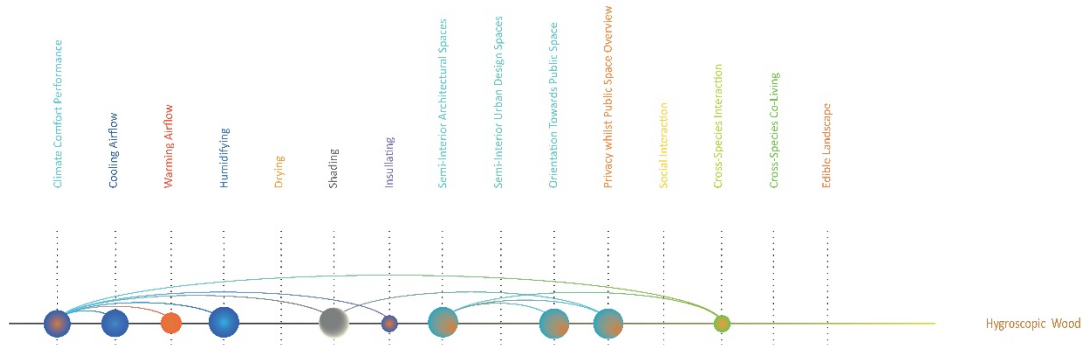


Figure 22: The detail of the gigamap showing eco-systemic performance of the mashrabīya with hygroscopic properties above (gigamap: Davidová 2019)

- **Scandinavian breathing screens and envelopes**

Scandinavian breathing screens and envelopes are semi-bordering multi-purpose and communication spaces, so called svalgangs (see Figure 23) and storing and working spaces called skuts or the main structure of the building. Very often, they are enveloping more or all three cases at one building in the same time (Davidová & Raková, 2018) (see Figure 25). In some of them, their performances are operated by their micro-climate through the material responsiveness while warping due to relative humidity and temperature (see Figure 25).

The first discussed case from the mountains (see Figure 23) is generating a semi-interior public space and urban design. It offers variety of opportunities of use, whilst graduating with its openings from almost fully open to almost fully closed, making possible rich interactions and opportunities of use even in harsher weather conditions. This svalgang offers many micro-climates and also opportunities for cross-species interaction and habitation, therefore also for generating edible landscape (see Figure 24). Such performance is critical for the social, cultural and natural metabolism of the surrounding, otherwise extreme, environment.

The bellow example from rainy west coast of Norway (see Figure 25) is enveloping semi-interior spaces for communication and storing as well as it is enveloping the main structure of the house at once. Through its hygroscopic responsive properties based on the tangential section of the wood material, it is moderating the micro-climate and therefore generating climate comfort of such in between spaces. In the same time, it is offering interaction and co-habitation with small sized species (see Figure 26). However, such traditional envelope does not offer that many opportunities for variety of uses and social situations. It concentrates on the micro-climatic moderation and, what would modernists call it, 'function'. Though this example is perhaps the closest towards the idea of architectural performance and co-design that is not operated by humans and this part shows great potential, it doesn't show much other than material-climate based interaction. The following design proposal is learning from such 'school of thought' whilst integrating also the others into a more holistic proposal for mild climates.



Figure 23: Breathing screen on a svalgang of a store house from Nes in Hallingdal dated 1700-1797, now in Oslo Open Air Museum (photo: Raková 2017)

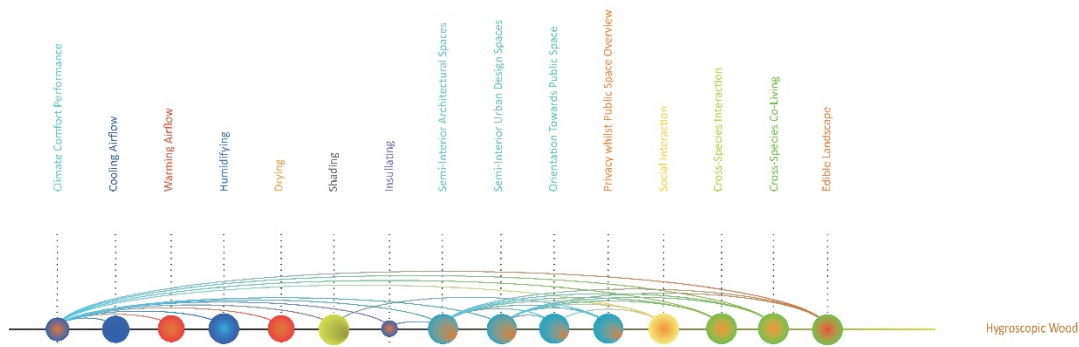


Figure 24: The detail of the gigamap showing eco-systemic performance of the Norwegian breathing screen with hygroscopic properties above (gigamap: Davidová 2019)



Figure 25: Breathing envelope that uses material performance of warping due to hygroscopicity of a store house from Nes, Øvre Valdsaroy, now in Open-Air Museum in Oslo (photo: Davidová 2016)

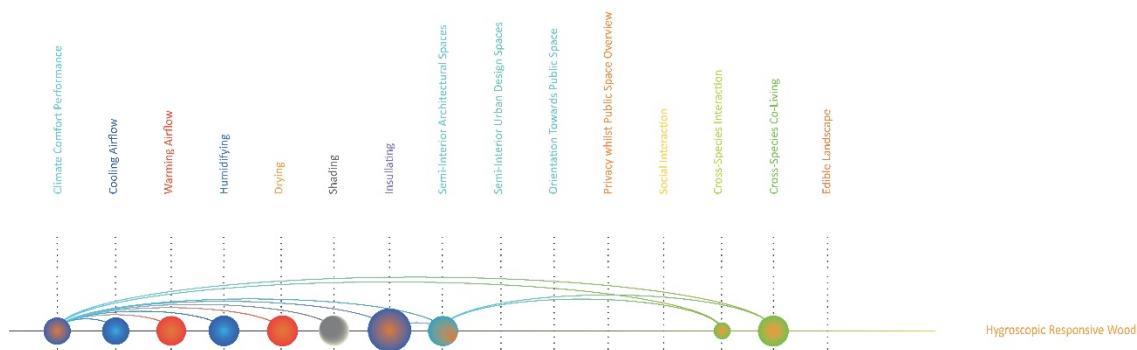


Figure 26: The detail of the gigamap showing eco-systemic performance of the Norwegian breathing envelope with responsive hygroscopic performance above (gigamap: Davidová 2019)

Synergy for Today Application

Morin explains that the society is the product of interactions between human individuals, but society is constituted with its emergencies, its culture, its language, which retroacts to the individuals and thus produces them as individuals supplying them with language and culture. We are products and producers (Morin, 2007). Nowadays, there is an increase in recent vernacular adaptations to today world through adding on similar bioclimatic layers as discussed in above section even in formally temperate climates (see Figure 27). This seems to be caused by recent socio-climatic changes around the globe (see Figure

2). The aid of co-design on moderating climate and privacy due to new multiple-directional weather extremes and other information overloading environment started substantially changing urban fabrics. This rises a potential of investigating the above 'schools of thoughts' (Hensel, 2015b) that have developed in extreme climates over generations. One of such investigation by design is a responsive screen Ray (see Figure 28).



Figure 27: Kyiv, vernacular add on spaces build on the basis of former balconies (photo: Davidová 2018)

The climate responsive screen Ray is designed for bio-climatic layers of onion principles of built environment and other cultural landscapes that can offer cross-species co-living situations whilst they are currently struggling with climate extremes and bio-diversity loss. It is learning from the schools of above discussed examples that have developed in climates of diverse extremes (low/high temperature, humidity and precipitation). This is for the reason that in today originally moderate climates, we are recently experiencing waves of all such kinds. Equally, we are receiving refugees' waves from such locations across different species, cultures or political situations. Such items and their conditions are truly interrelated, and we need to consider such if we wish to talk about adaptation.

To relate to the above samples, the synthesising Ray screen co-operates based the responsivity of solid wood through warping of panels in tangential section such as in Norwegian screen cases (see Figure 25) as well as it evaporates and circulates the moisture in arid conditions such as oriental mashrabīya (see Figure 21). Its openings are substantially larger when warping, therefore enable more cross-species opportunities of climate related use and social situations. This performance is even more supported by sorption of the algae habitation as this co-performance is moderated by co-living with algae that regulates its moisture content. Its climatic moderation supports co-living with other species in the semi-interior and urban design spaces and architectures that it is to cover (Davidová, 2017).

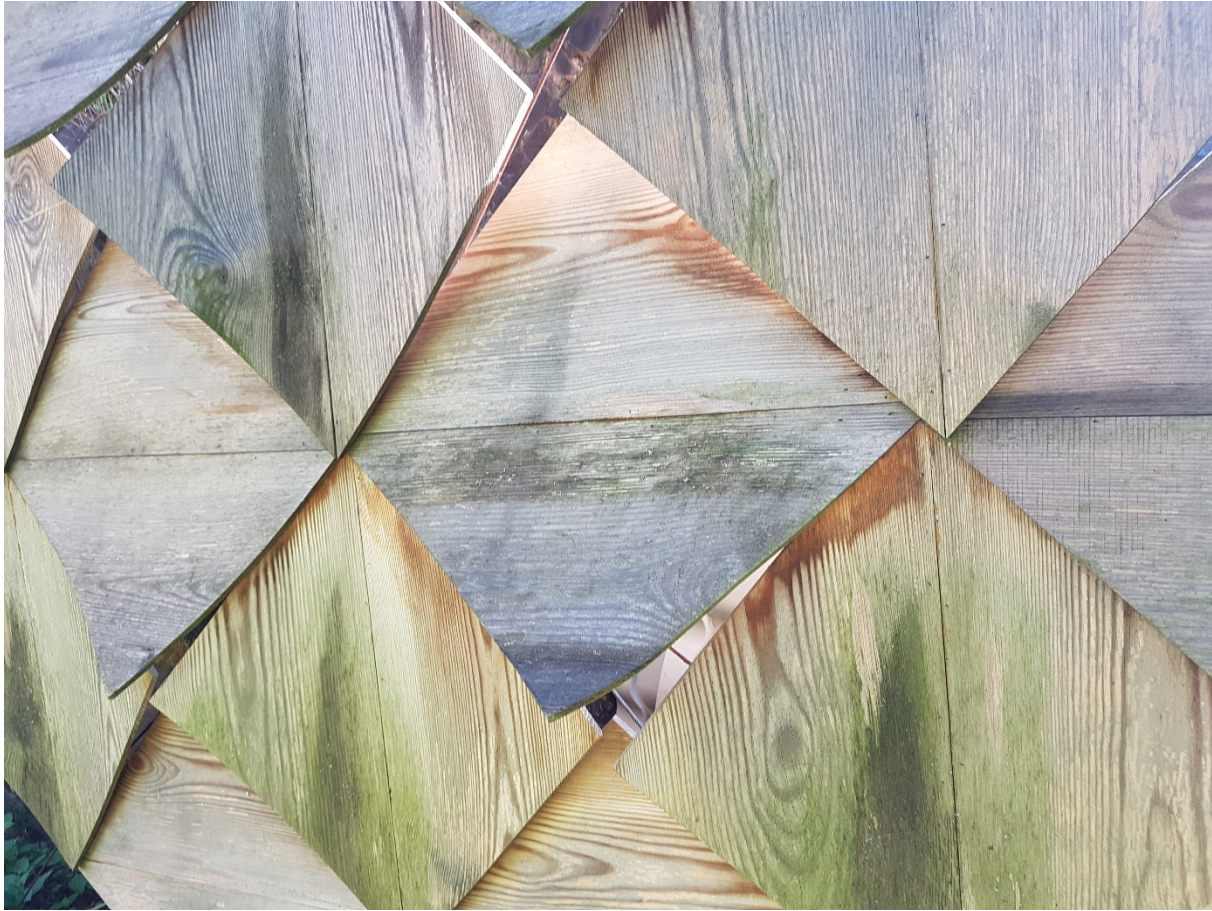


Figure 28: Responsive screen Ray (photo: Davidová 2018)

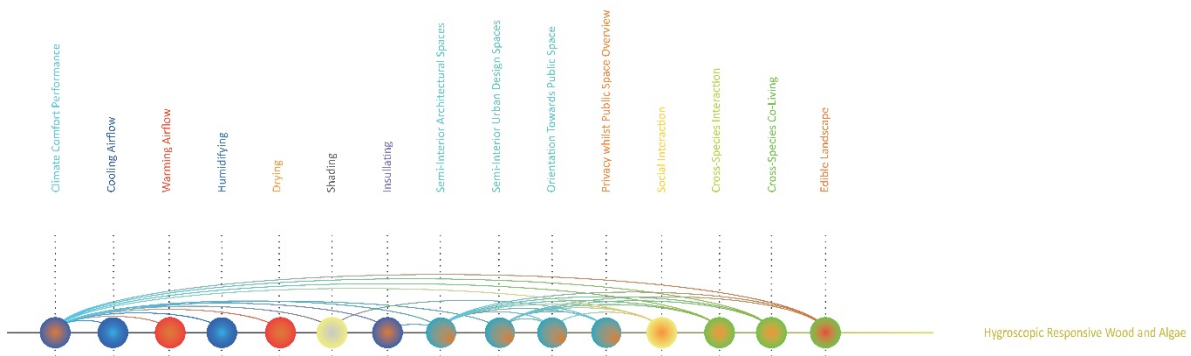


Figure 29: The detail of the gigamap showing eco-systemic performance of the responsive screen and envelope Ray above (gigamap: Davidová 2019)

Discussion and Conclusions

Morin makes it clear that in opposition to reduction, complexity requires that one tries to comprehend the relations between the whole and the parts. The knowledge of the parts is not enough, the knowledge of the whole as a whole is not enough, if one ignores its parts; one is thus brought to make a come and go in loop to gather the knowledge of the whole and its parts (Morin, 2007). I.e. Complex Adaptive Systems theory seeks to discover common principles of organization across social and material categories and it is apparent that the environmental crisis produces also social crises (Smith-Nonini, 2017). Moreover, Capra explores notions like spirituality that is usually understood as a way of being that flows from a certain profound experience of reality, which is known as 'mystical', 'religious', or 'spiritual' experience. And that there are numerous descriptions of such experience in the literature of the world's religions, which tend to agree that it is a direct, non-intellectual experience of reality with some fundamental characteristics that are independent of cultural and historical contexts (Capra, 2015). Such discussion makes clear that there is a need of relating hard with soft; or even tacit data and knowledge.

Following the multiplicity of diverse theories and visions integrated to a complex picture, this paper and the research by design work touches the synergies of the collected and generated holistic knowledge for former design interpretations and new design generations. The two kinds oscillate in feedback loops in non-linear manner in time and across the variety of disciplines. It discusses a possible eco-systemic change, therefore also the change in governance and social systems, within urban and semi-urban fabric that may lead towards climate change adaptation and biodiversity loss mitigation whilst supporting food security, climate and social comfort across the multiple species in built up environment, their appearance and abundance. This can be achieved through either new built architectures and urban design or parasitic structures, nested on current built up environment as a sort of interpretation of 'auxiliary architectures' (Hensel, 2015a) while inventing schools of thoughts through vernacular culture and co-designed co-performance.

Both the southern and the northern breathing walls are moderating the interaction of the building with extreme climate and its environmental-socio-cultural interaction (Davidová, 2016). A new complexity to conceive living organization: the autonomy cannot be conceived without its ecology (Morin, 2007). That one is drastically moving with climate change and cross-species and cross-cultural migration. This is including human species, amongst the others. Gehl states that the interplay between the intensity and distance of sensual impressions is widely used in human [and other species] communication. The intense emotional contacts take place at quite close range, 0 to ½ meters (0 to 2 ft.), where all the senses can work together and where all nuances and details can be perceived clearly, while the less intense contacts take place at greater distances, ½ to 7 meters (2 to 20 ft.) (Gehl, 2011). However, this can vary for different cultures, landscapes, territories [and species] and moreover, similar relation in reference to micro-climate appears in individual and collective climate comforts that also again relate to behavioural comforts. With recent climate extremes and to enhance the social interaction comfort, we need to moderate climate and provide co-living opportunities in milder region the same way as it has been a tradition in vernacular cultures in extreme climates. The moderation needs to learn from variety of extreme peaking examples as we recently experience variety of extremes (droughts, floods, extreme heat or cool waves).

The provision of co-living opportunities with insects that is seen as an advantage in this paper in respect to recent biodiversity loss is however criticised in different, still very modernist; vernacular architectures' knowledge adaptations strategies by recent authors such as i.e. Shritastav and Jones (Srivastav & Jones, 2009). This is particularly surprising as the same authors call for a greenery integration within the same context (ibid), obviously not considering at least any habitation of pollinators. Therefore, also with recent progression hope, it appears that climate change cannot be

handed other way than by social change. This social change that necessarily integrates and synergises with other changes is envisioned by the author as a transition towards Post-Anthropocene of cross-species coliving within bio-technological landscape and biosphere.

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